Fig. 1

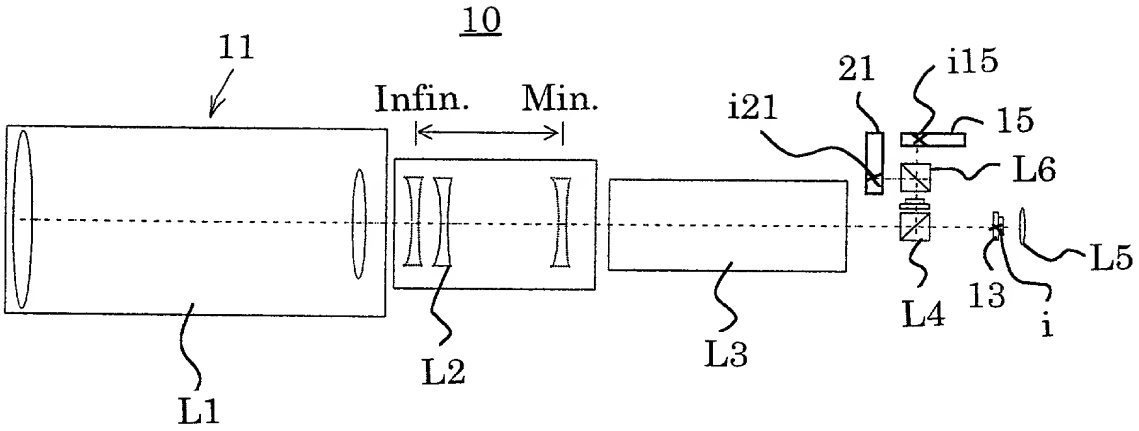


Fig. 2A

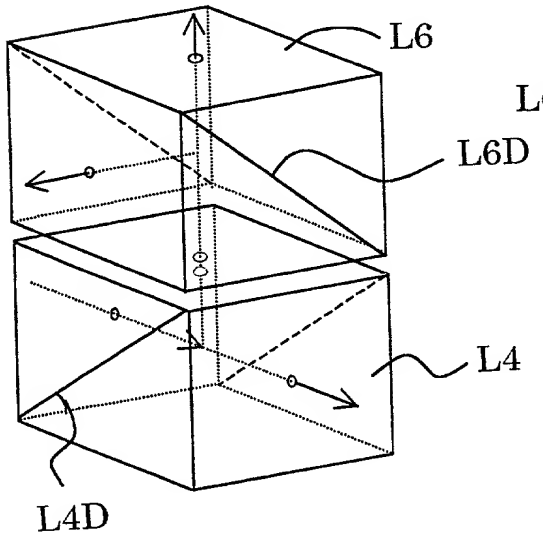


Fig. 2B

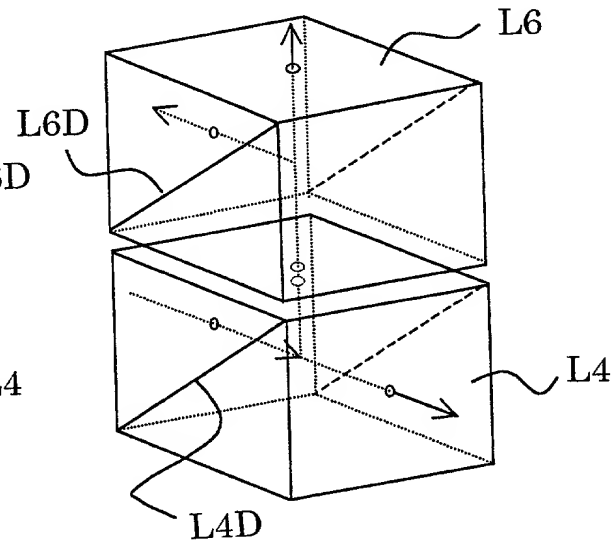


Fig.3

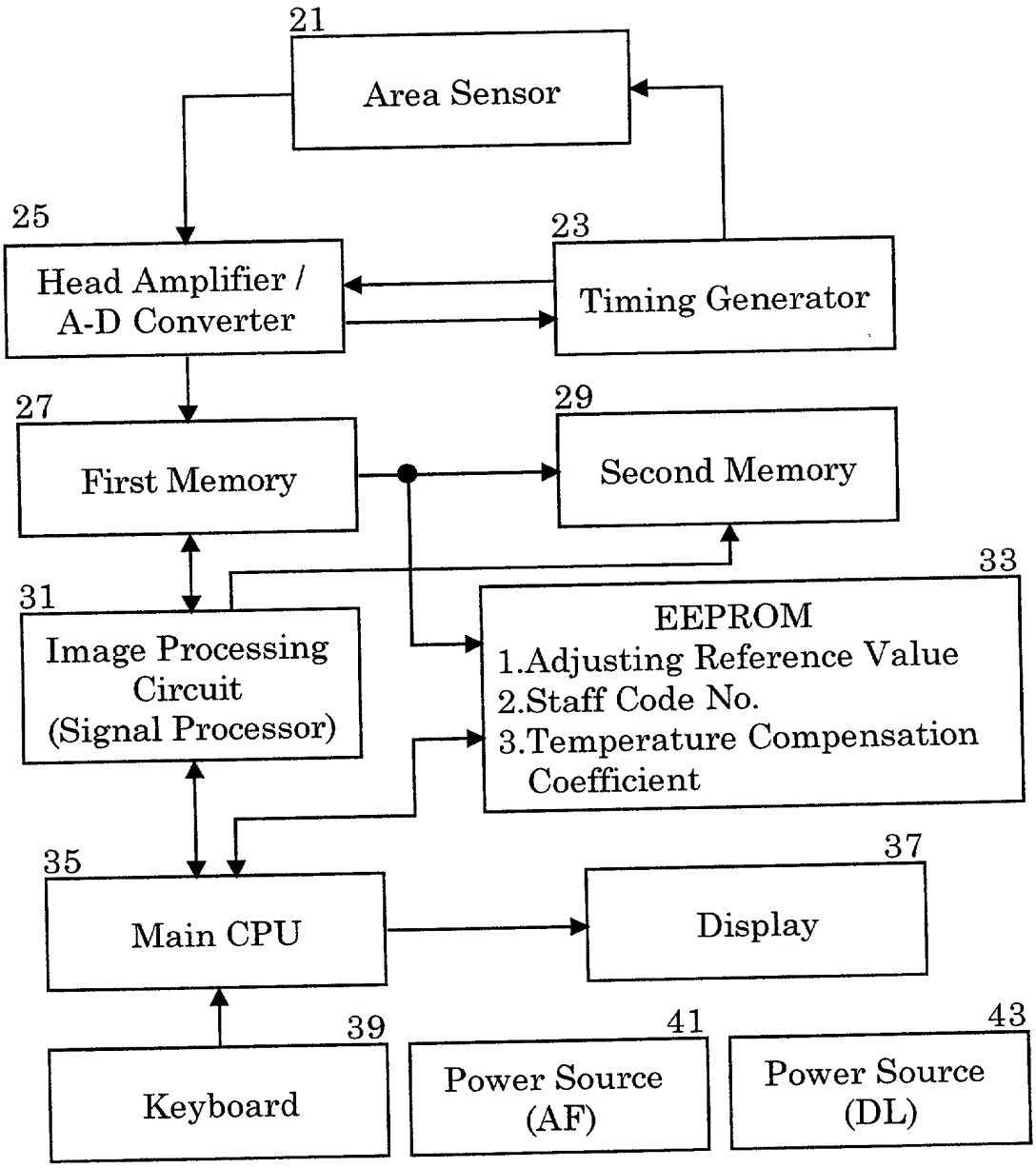

21
Area Sensor
25
Head Amplifier / A-D Converter
23
Timing Generator
27
First Memory
29
Second Memory
33
EEPROM
1.Adjusting Reference Value
2.Staff Code No.
3.Temperature Compensation Coefficient
31
Image Processing Circuit (Signal Processor)
35
Main CPU
37
Display
39
Keyboard
41
Power Source (AF)
43
Power Source (DL)

Fig. 4

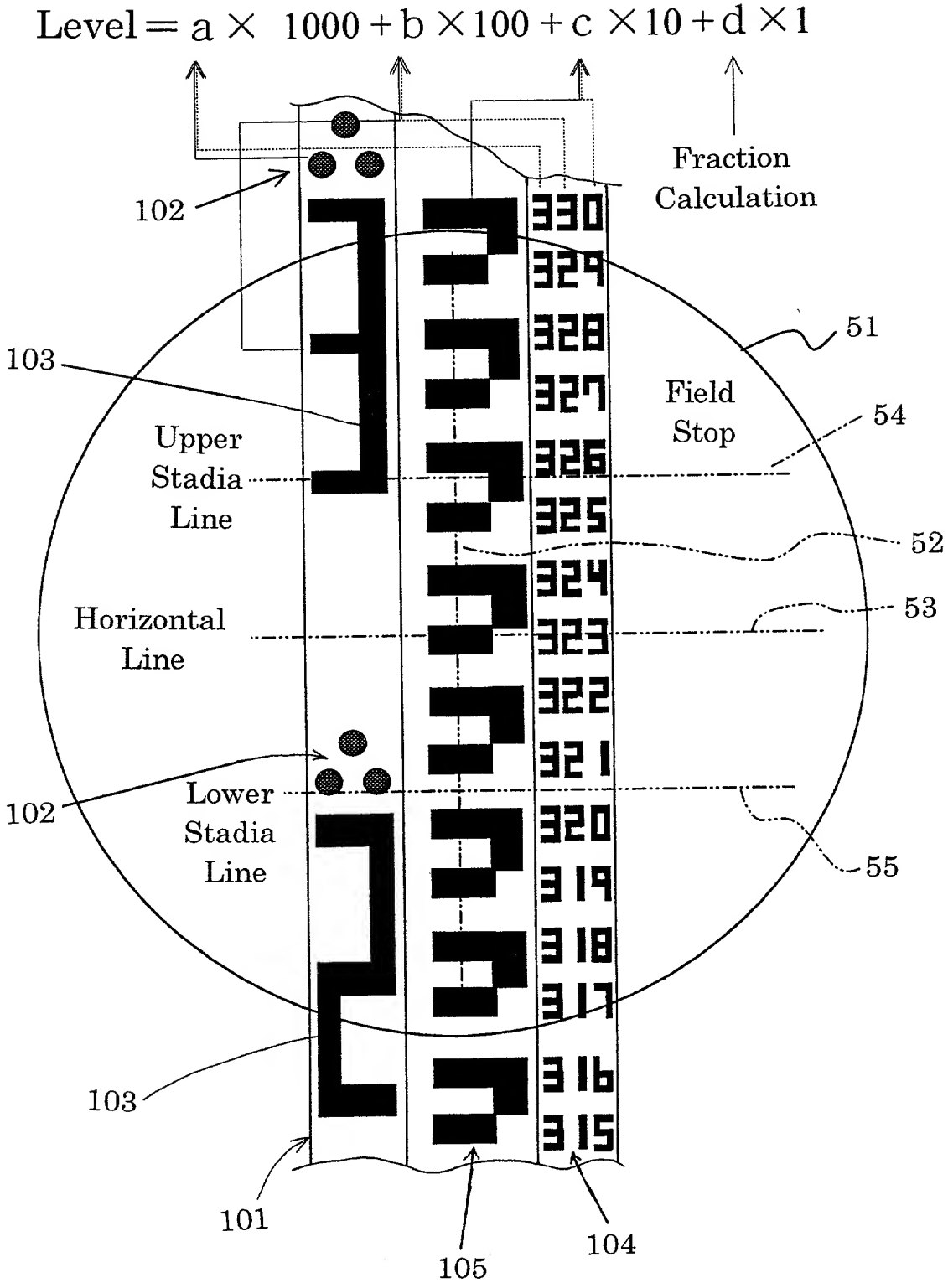

Level = a × 1000 + b × 100 + c × 10 + d × 1
Fraction Calculation
102
330
329
328
327
326
325
324
323
322
321
320
319
318
317
316
315
51
103
Field Stop
54
Upper Stadia Line
52
53
Horizontal Line
102
Lower Stadia Line
55
103
101
105
104

Fig. 5

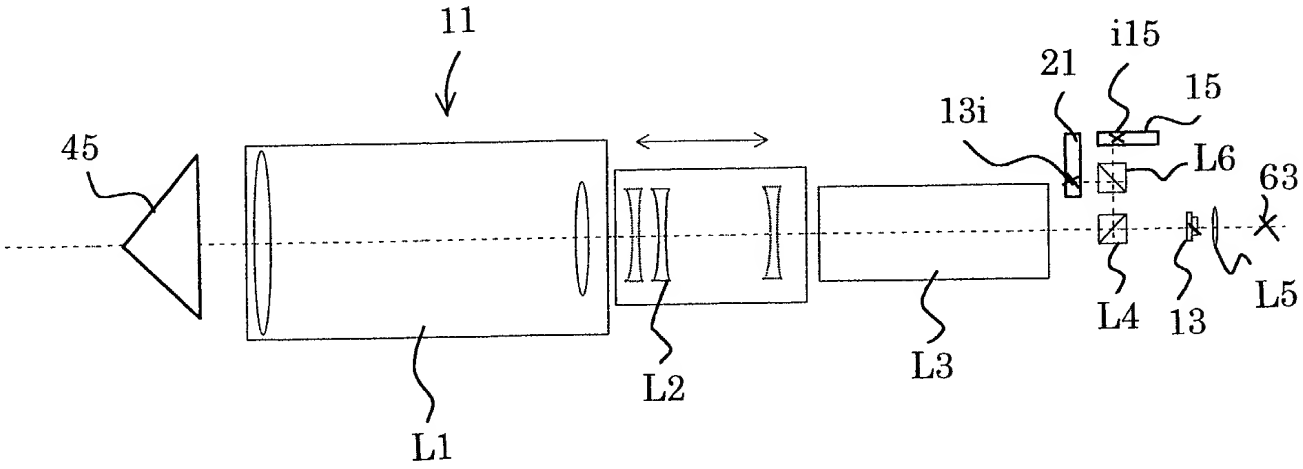


Fig.6A

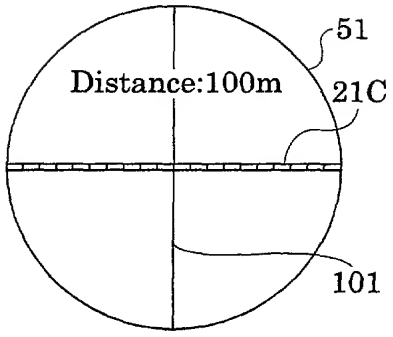


Fig.6B

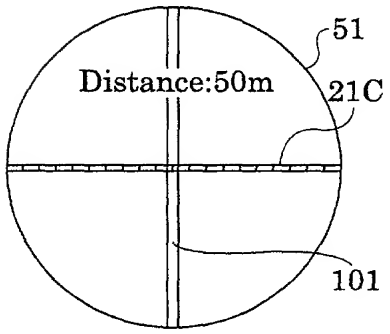


Fig.6C

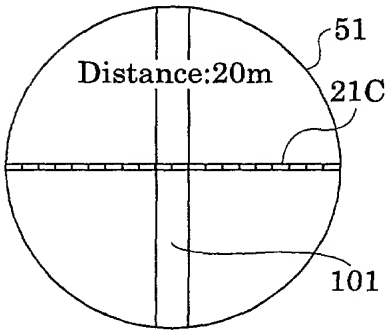


Fig.6D

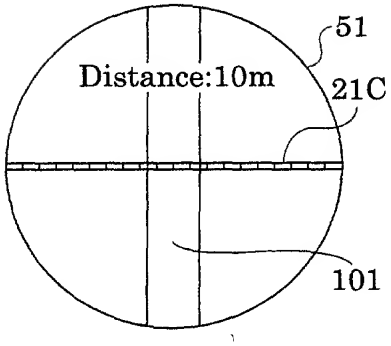


Fig.6E

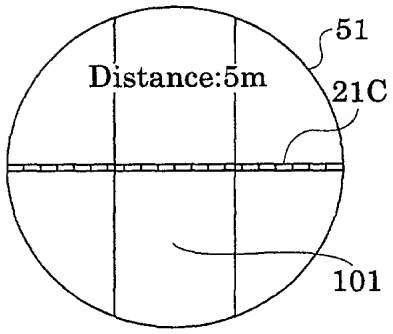


Fig.6F

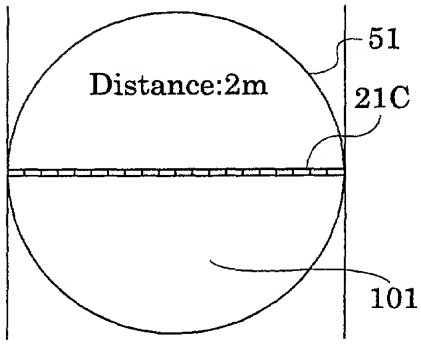


Fig. 7

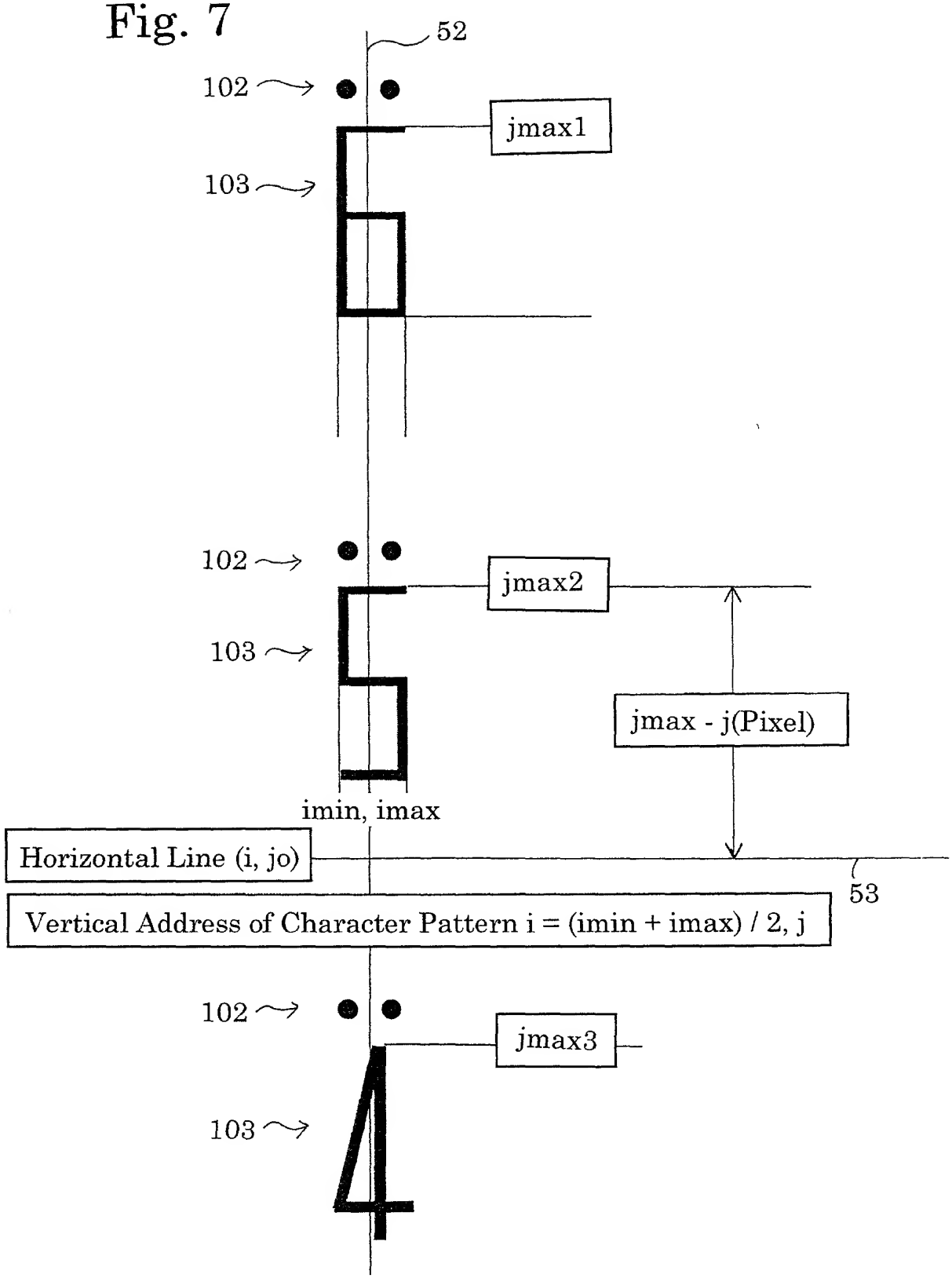

52
102
jmax1
103
102
jmax2
103
jmax - j(Pixel)
imin, imax
Horizontal Line (i, jo)
53
Vertical Address of Character Pattern i = (imin + imax) / 2, j
102
jmax3
103

Fig. 8

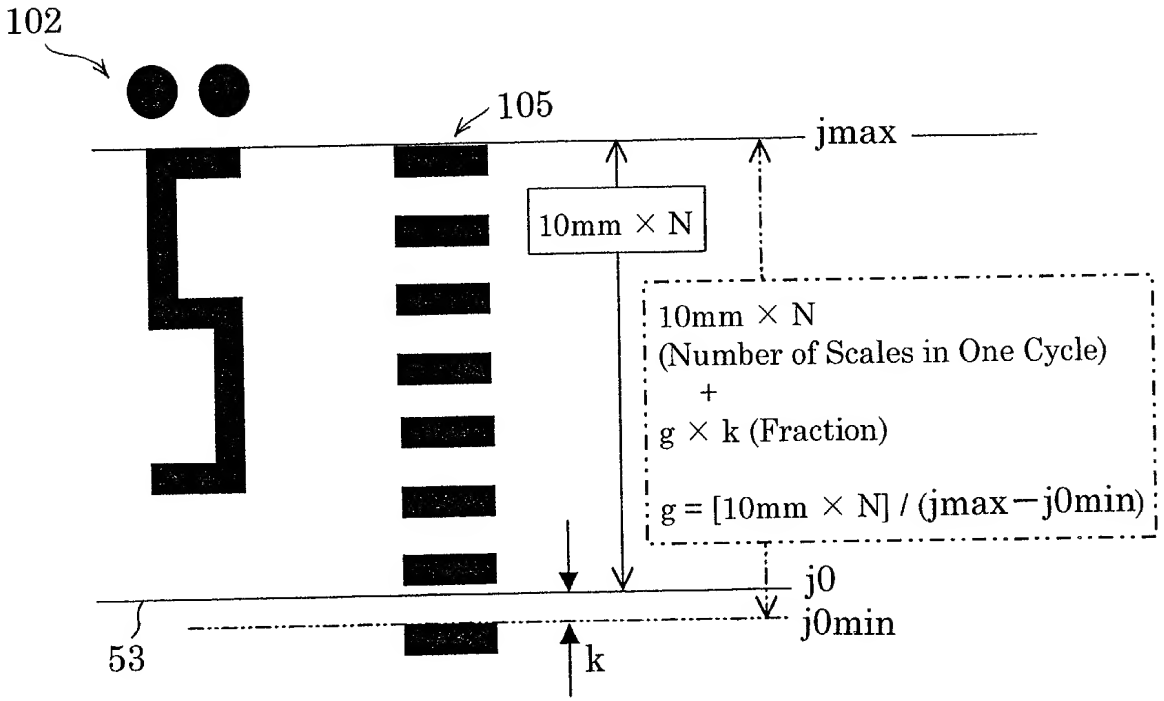
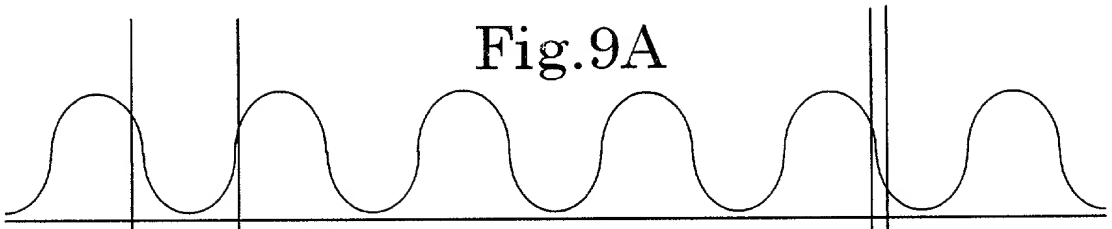

102
105
jmax
10mm × N
10mm × N
(Number of Scales in One Cycle)
+
g × k (Fraction)
g = [10mm × N] / (jmax−j0min)
j0
j0min
53
k

Fig.9A

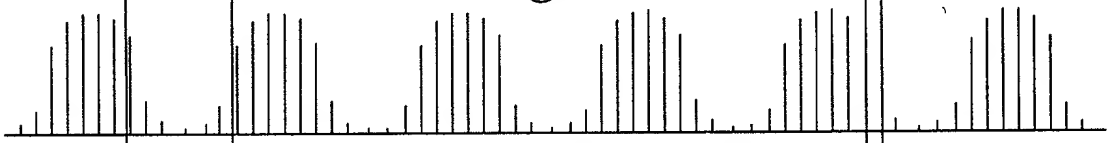


Minimum Graduation Read Signal

Fig.9B

CCD Line Sensor

Fig.9C

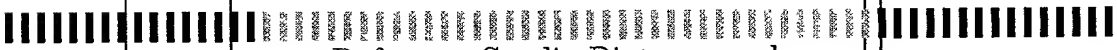


CCD Line Sensor Sampling Signal

Fig.9D

Square Process of Reproduction Signal

Fig.9E



Reference Stadia Distance and
Extension Stadia Distance

Fig.9F

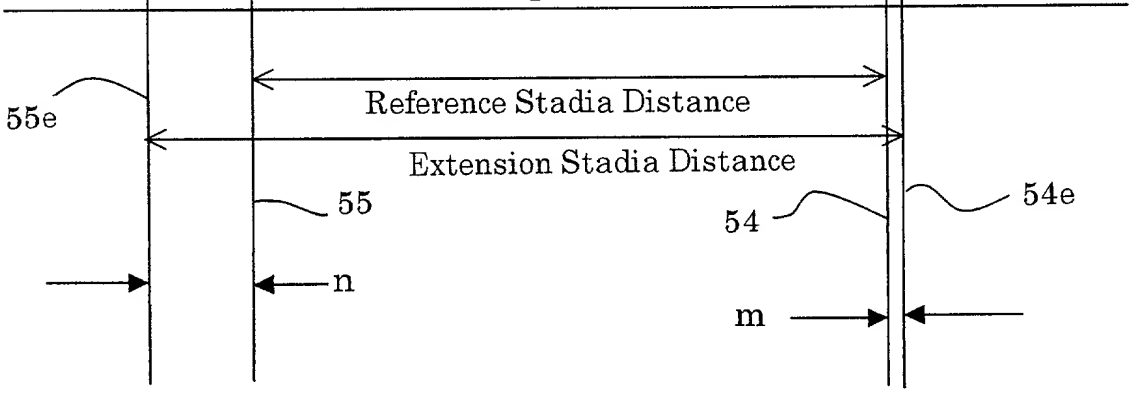


Fig.10A

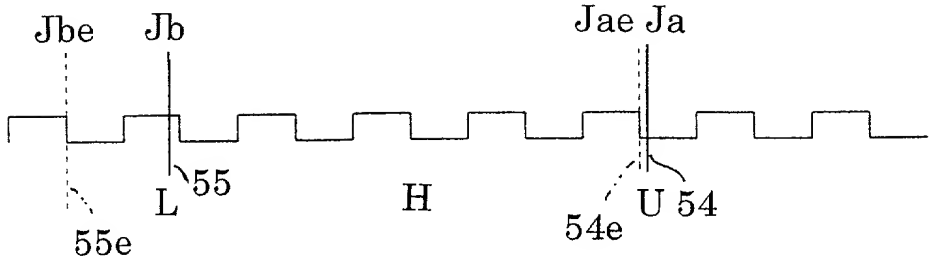


Fig.10B

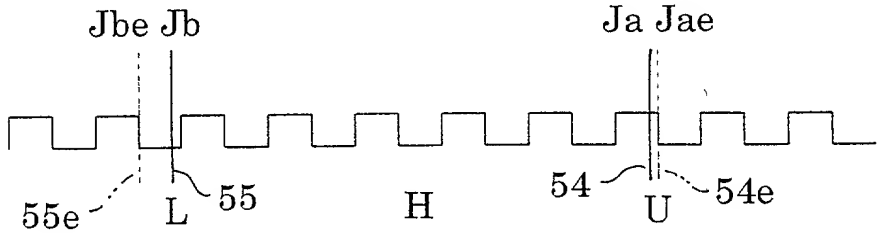


Fig.10C

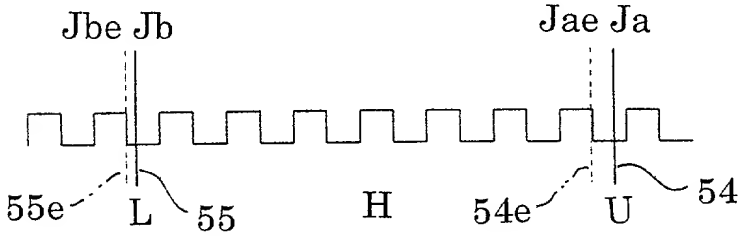


Fig.10D

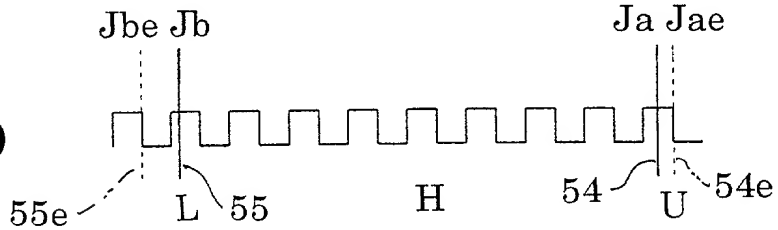


Fig.11

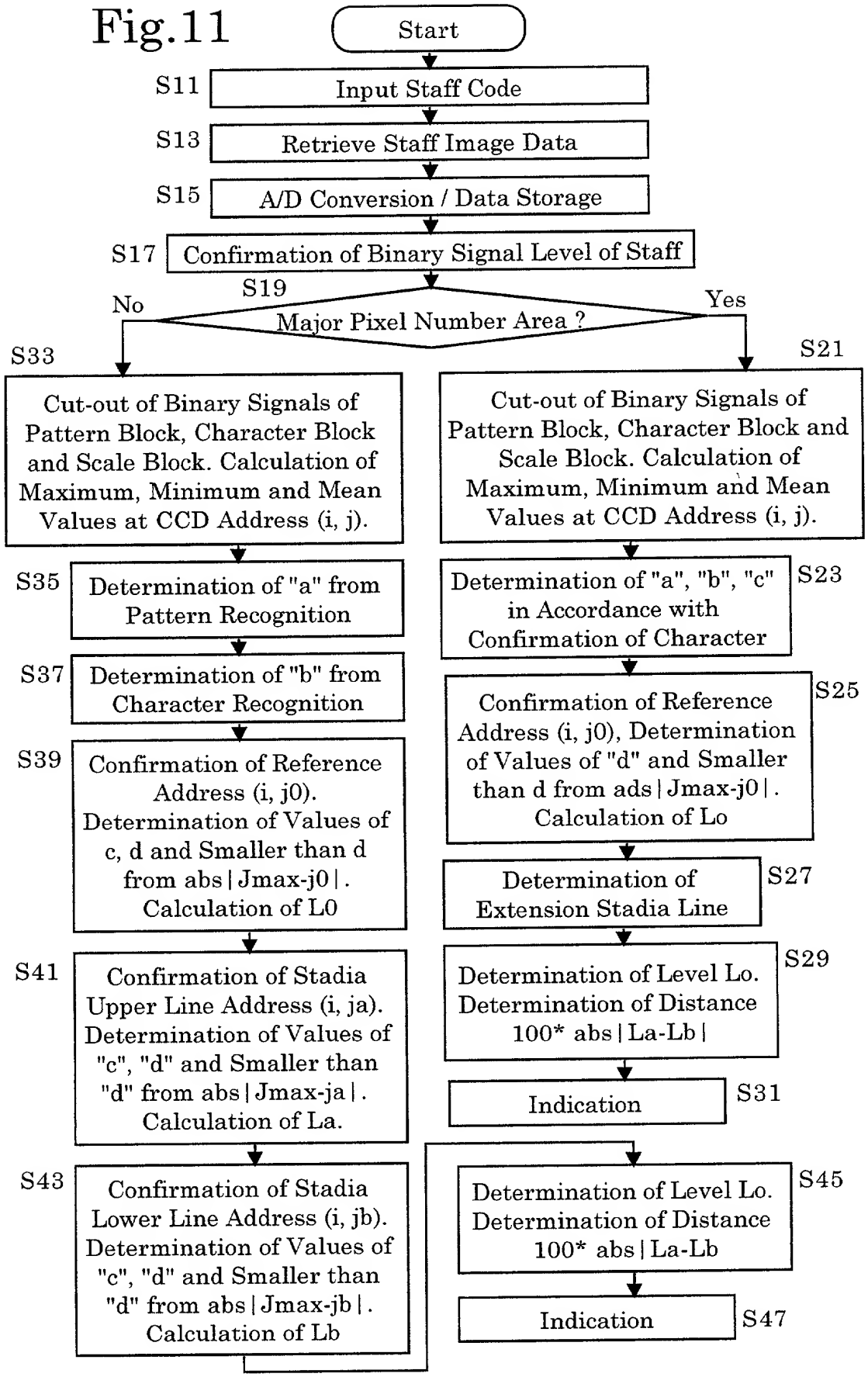

Start
S11
Input Staff Code
S13
Retrieve Staff Image Data
S15
A/D Conversion / Data Storage
S17
Confirmation of Binary Signal Level of Staff
S19
Major Pixel Number Area ?
No
Yes
S33
Cut-out of Binary Signals of Pattern Block, Character Block and Scale Block. Calculation of Maximum, Minimum and Mean Values at CCD Address (i, j).
S35
Determination of "a" from Pattern Recognition
S37
Determination of "b" from Character Recognition
S39
Confirmation of Reference Address (i, j0). Determination of Values of c, d and Smaller than d from abs | Jmax-j0 | . Calculation of L0
S41
Confirmation of Stadia Upper Line Address (i, ja). Determination of Values of "c", "d" and Smaller than "d" from abs | Jmax-ja | . Calculation of La.
S43
Confirmation of Stadia Lower Line Address (i, jb). Determination of Values of "c", "d" and Smaller than "d" from abs | Jmax-jb | . Calculation of Lb
S21
Cut-out of Binary Signals of Pattern Block, Character Block and Scale Block. Calculation of Maximum, Minimum and Mean Values at CCD Address (i, j).
S23
Determination of "a", "b", "c" in Accordance with Confirmation of Character
S25
Confirmation of Reference Address (i, j0), Determination of Values of "d" and Smaller than d from ads | Jmax-j0 | . Calculation of Lo
S27
Determination of Extension Stadia Line
S29
Determination of Level Lo. Determination of Distance 100* abs | La-Lb |
S31
Indication
S45
Determination of Level Lo. Determination of Distance 100* abs | La-Lb
S47
Indication

Fig. 12

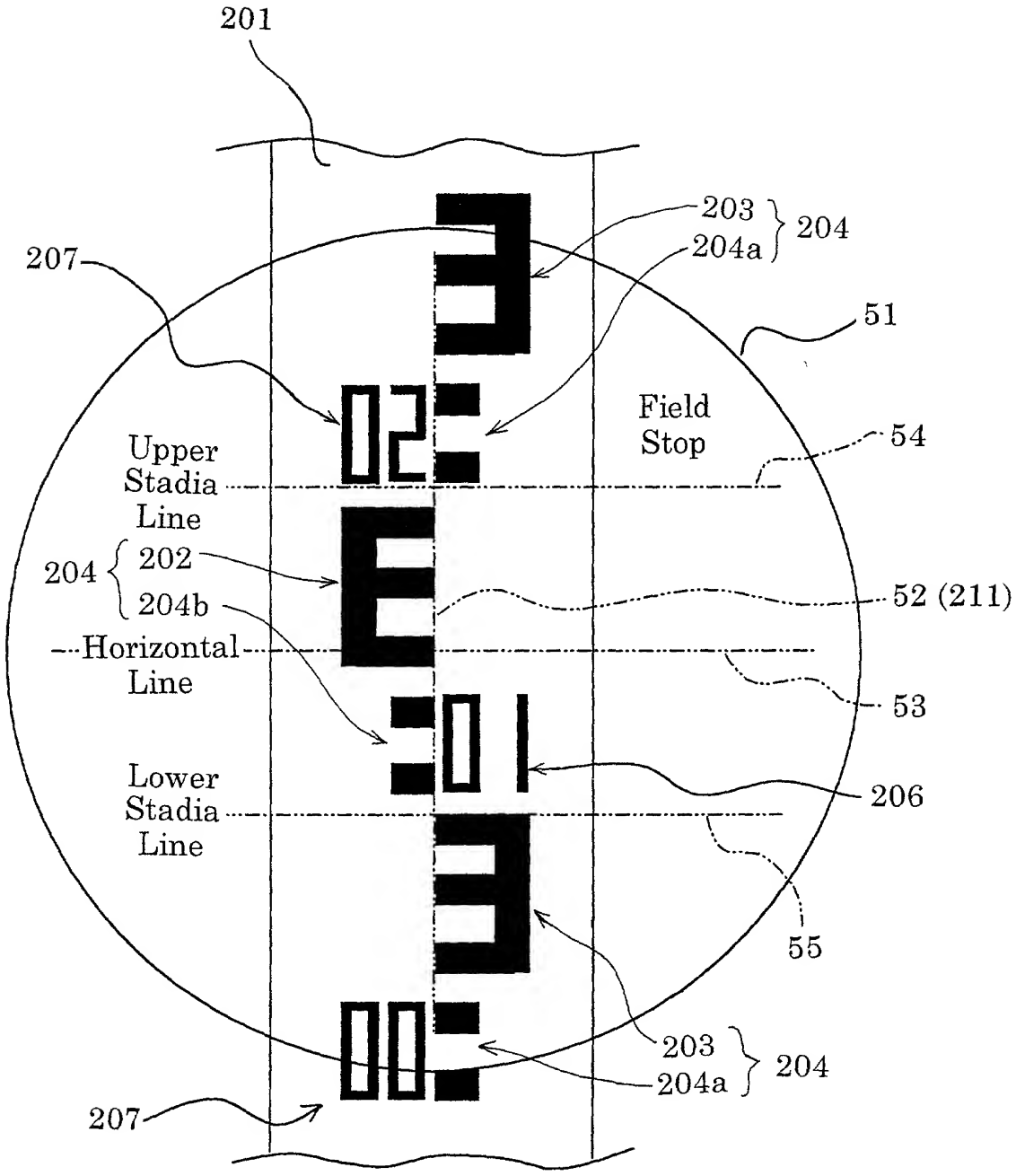

201
203
204a
204
207
51
Field
Stop
54
Upper
Stadia
Line
204
202
204b
52 (211)
Horizontal
Line
53
Lower
Stadia
Line
206
55
203
204a
204
207

Fig. 13

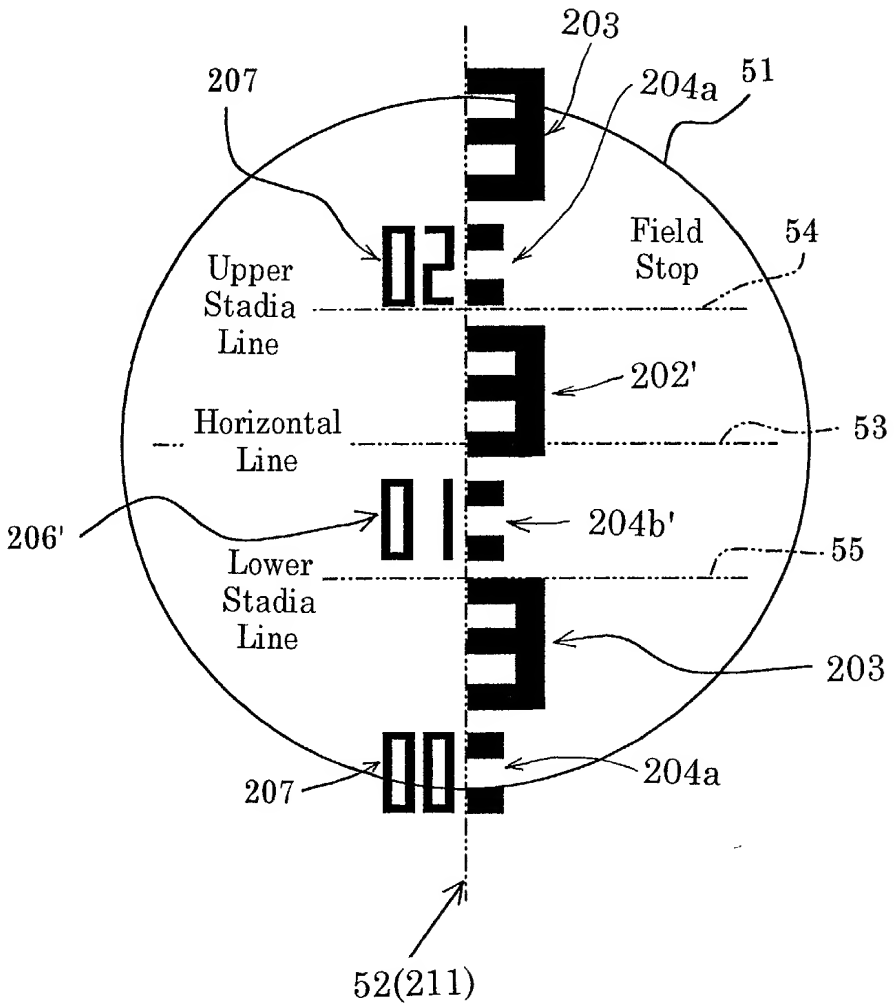
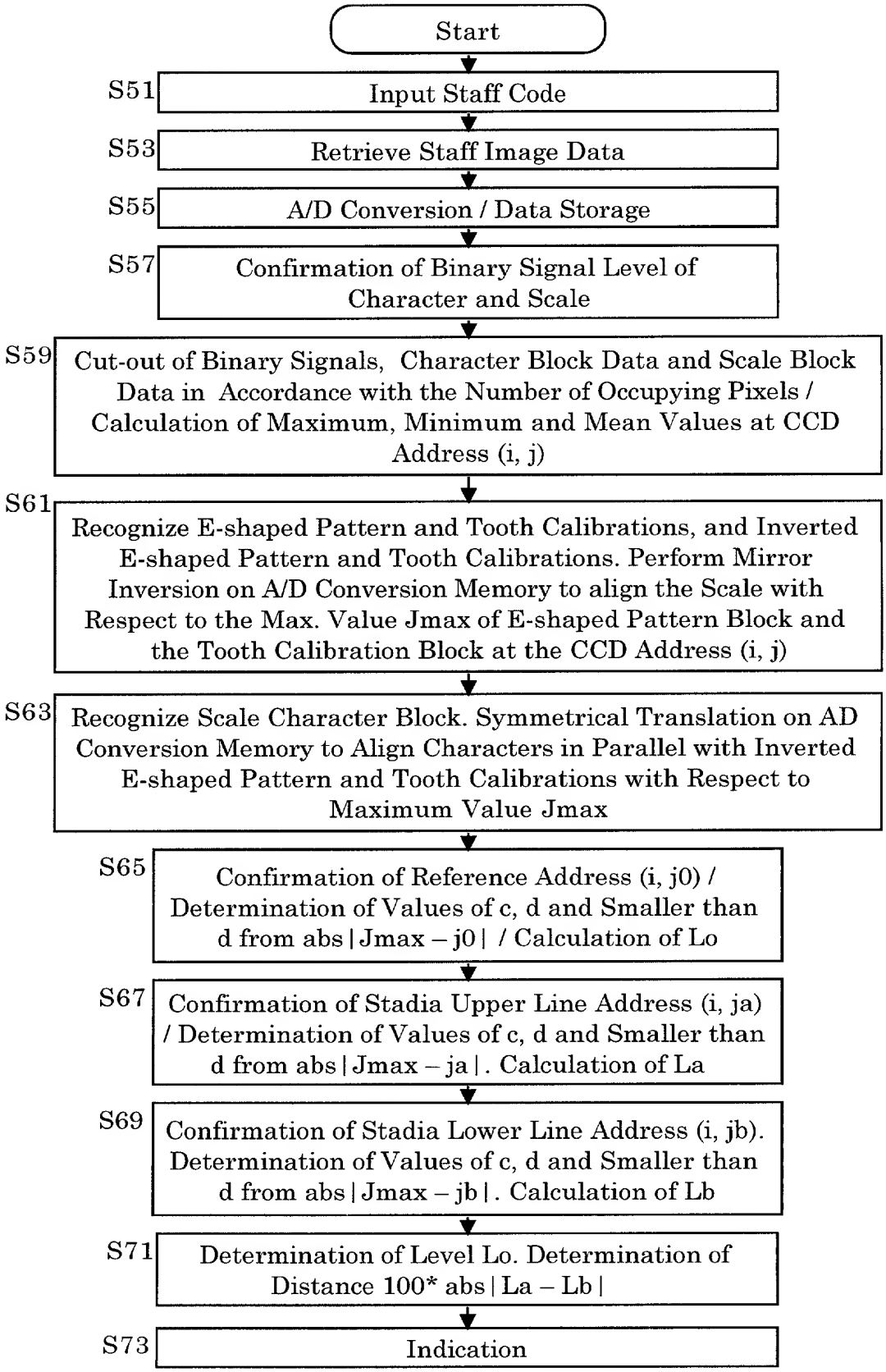

203
207
204a
51
Field
Stop
54
Upper
Stadia
Line
202'
Horizontal
Line
53
206'
204b'
55
Lower
Stadia
Line
203
207
204a
52(211)

Fig.14


Start
S51
Input Staff Code
S53
Retrieve Staff Image Data
S55
A/D Conversion / Data Storage
S57
Confirmation of Binary Signal Level of Character and Scale
S59
Cut-out of Binary Signals, Character Block Data and Scale Block Data in Accordance with the Number of Occupying Pixels / Calculation of Maximum, Minimum and Mean Values at CCD Address (i, j)
S61
Recognize E-shaped Pattern and Tooth Calibrations, and Inverted E-shaped Pattern and Tooth Calibrations. Perform Mirror Inversion on A/D Conversion Memory to align the Scale with Respect to the Max. Value Jmax of E-shaped Pattern Block and the Tooth Calibration Block at the CCD Address (i, j)
S63
Recognize Scale Character Block. Symmetrical Translation on AD Conversion Memory to Align Characters in Parallel with Inverted E-shaped Pattern and Tooth Calibrations with Respect to Maximum Value Jmax
S65
Confirmation of Reference Address (i, j0) / Determination of Values of c, d and Smaller than d from abs | Jmax – j0 | / Calculation of Lo
S67
Confirmation of Stadia Upper Line Address (i, ja) / Determination of Values of c, d and Smaller than d from abs | Jmax – ja | . Calculation of La
S69
Confirmation of Stadia Lower Line Address (i, jb). Determination of Values of c, d and Smaller than d from abs | Jmax – jb | . Calculation of Lb
S71
Determination of Level Lo. Determination of Distance 100* abs | La – Lb |
S73
Indication